United States Department of Agriculture

USDA

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Conservation Service

Soil Data Viewer 5.1
User Guide

Soil Survey Division
October 2006

Introduction

What is "Soil Data Viewer"

Soil Data Viewer is a tool built as an extension to ArcMap that allows a user to create soil-based thematic maps. The application can also be run independent of ArcMap, but output is then limited to a tabular report.

The soil survey attribute database associated with the spatial soil map is a complicated database with more than 50 tables. Soil Data Viewer provides users access to soil interpretations and soil properties while shielding them from the complexity of the soil database. Each soil map unit, typically a set of polygons, may contain multiple soil components that have different use and management. Soil Data Viewer makes it easy to compute a single value for a map unit and display results, relieving the user from the burden of querying the database, processing the data and linking to the spatial map.

Soil Data Viewer contains processing rules to enforce appropriate use of the data. This provides the user with a tool for quick geospatial analysis of soil data for use in resource assessment and management.

What software and capabilities do I need to use Soil Data Viewer 5.1?

1. Microsoft Windows XP Professional or Microsoft Windows XP Home Edition

2. Version 1.1 of the Microsoft .Net Framework

    In order to run Soil Data Viewer, version 1.1 of the Microsoft .NET Framework must be installed on your PC. Version 2.0 of the Microsoft .NET Framework may also be installed, but Soil Data Viewer will not work with version 2.0 of the Microsoft .NET Framework alone.

3. Adobe Reader

    In order to be able to view reports produced by the Soil Data Viewer application, you must have some version of Adobe Reader installed on your PC. Adobe Reader can be downloaded and installed for free.

4. ESRI ArcGIS 9.0 or 9.1, with .NET support installed

If you want to be able to generate thematic maps, you must have ESRI's ArcGIS 9.0 or 9.1 installed on your PC. For ArcGIS 9.0, service pack 3 must be installed. For ArcGIS 9.1, the corresponding service pack level doesn't matter.

In addition, in order to be able to register Soil Data Viewer as a plug-in to ArcMap, .NET support must have been installed when ArcGIS was installed.

5. WinZip or its equivalent

If you intend to obtain and prepare soil data for use with Soil Data Viewer, you will need to have WinZip or an equivalent application installed on your PC, since all soil data is provided in zip files.

6. Microsoft Access

Although Soil Data Viewer does not require Microsoft Access in order to run, if you don't have Microsoft Access installed on your PC you will have to impose on someone who does have Microsoft Access in order to prepare data for use with Soil Data Viewer. At the current time soil database templates for Access 97, Access 2000 and Access 2002/2003 are available.

7. Internet Access and a Web Browser

If you intend to obtain and prepare soil data for use with Soil Data Viewer, you will also need internet access and a Web browser in order to obtain that data.

What data do I need to run Soil Data Viewer?

At a minimum, you must acquire the tabular soil data for your area of interest. If you wish to create soil thematic maps, you must also acquire the spatial soil data for your area of interest.

Soil tabular and spatial data is not available for all parts of the United States and its territories. For some areas, neither tabular nor spatial soil data may be available. For some areas, only tabular soil data may be available.

The soil data needed for Soil Data Viewer is available from the Soil Data Mart. The Soil Data Mart is a database and Web application that provides soil tabular data in a single format and soil spatial data in a variety of formats. The home page of the Soil Data Mart is:

http://soildatamart.nrcs.usda.gov

How do I obtain the soil data needed for Soil Data Viewer?

To determine what data is available for your area of interest, go to the Soil Data Mart's home page at http://soildatamart.nrcs.usda.gov. For Macintosh users, the Safari browser is not compatible with the Soil Data Mart, but the Macintosh version of Firefox is.

You can determine what data is available for your area of interest in a couple of ways.

1. Open and browse the soil data availability map on the Soil Data Mart's home page.

2. On the Soil Data Mart's home page, click "Select State". On the Select State page, select the state or territory that contains your area of interest and then click "Select County". On the Select County

Once you have determined a survey area for which you wish to obtain data, on the Select Survey Area page, select the survey area that includes your area of interest and then click "Download Data". On the "Download Data" page, you must specify the following:

Data Options

Tabular Data Only: If you are running SDV in standalone mode or you don't need to create thematic maps, all you need is the tabular data for your area of interest.

Tabular and Spatial: If you want to be able to create thematic maps you will need both the tabular and spatial data for your area of interest. Please keep in mind that for some survey areas, no spatial data may be available.

Spatial Data Only: Unless you have come back to obtain the spatial data for an area for which you already have the corresponding tabular data, there is no reason to choose this option. Soil Data Viewer will not produce anything unless you have the tabular data for your area of interest.

Spatial Options

Spatial Format: For this version of Soil Data Viewer, spatial data must be in shapefile ("ArcView Shapefile") format.

Coordinate System: From the available choices, choose the coordinate system that best meets your needs. If you're not sure exactly what you need, the default coordinate system, UTM, will likely suffice.

Template Database

In order to run Soil Data Viewer, the tabular data for your area of interest must be imported into what we refer to as a SSURGO template database. A SSURGO template database is a Microsoft Access database.

If a custom database exists for the state that contains your area of interest, a database for that state will be selected by default. If not, one of the national template databases will be selected by default.

A given database may be available in several versions of Microsoft Access. If necessary, change the default selection to a version that is compatible with the version of Microsoft Access that is installed on your PC. If there isn't a suitable Microsoft Access version of a state specific database, choose one of the national template databases at the top of the list. Keep in mind that MS Access versions 2002 and 2003 are compatible. Also keep in mind that a newer version of Microsoft Access can typically convert a database in an older version of Microsoft Access.

Once you have specified the appropriate options on the Download Data page, fill in your e-mail address and then click "Submit Request". Your download request will be queued and run sometime later (generally within 24 hours). After your download request has been processed, you will receive an e-mail containing an embedded link that you can click to retrieve the data that you requested.

How do I prepare the data needed to run Soil Data Viewer?

Data obtained from the Soil Data Mart requires some preparation before it can be used with Soil Data Viewer. In order to prepare data exported from the Soil Data Mart for use with Soil Data Viewer, you must have WinZip, or a suitable equivalent installed on your PC. You must also have a version of Microsoft Access installed on your PC that is compatible with whatever version of the MS Access SSURGO template database you have selected to be included in your download.

1. When you have received your e-mail notice from the Soil Data Mart informing you that your request has been processed, click on the embedded FTP link in that e-mail. When the dialog box comes up, select "Save", specify a directory location and click "OK".

2. A download request from the Soil Data Mart is zipped into a single file with a name like "soil_ne079.zip". The string "ne079" identifies the soil survey area whose data is contained within the zip file. The name of this zip file depends on which survey area was selected when the export was requested.

After downloading this file, copy it to the desired directory and unzip it using WinZip or a suitable equivalent. Unzipping "soil_ne079.zip" creates a directory named "soil_ne079" in the directory into which that file is unzipped. This directory will initially contain some or all of the following.

1. A file named "readme.txt".

   This file documents the contents and structure of the corresponding export. It contains a lot of the same information that appears in this section.

2. A file named "soil_metadata_ne079.txt".

   This file contains the corresponding Federal Geographic Data Committee (FGDC) metadata for the corresponding survey area, in ASCII text format.

3. A file named "soil_metadata_ne079.xml".

This file contains the corresponding Federal Geographic Data Committee (FGDC) metadata for the corresponding survey area, in XML format.

4. A file named something like "soildb_US_2002.zip".

A zip file will only be present if your export includes a SSURGO template database. The name of this file varies depending on which template database was selected when the export was requested.

5. A directory named "spatial".

If your export includes soil spatial data, that data will reside in this directory. For Soil Data Viewer, the critical file in this directory is the one corresponding to the soil map unit polygon layer. This file's name will be something like "soilmu_a_ne079.shp", where the last five characters of the non-extension portion of the file name, "ne079", indicate the corresponding soil survey area. This file is only one of several files that make up the soil map unit polygon layer, but this is the file you explicitly select in order to load this map layer into ArcMap.

6. A directory named "tabular".

If your export includes soil tabular data, that data will reside in this directory.

3. Using WinZip or a suitable equivalent, unzip the SSURGO template database file into the desired location.

4. Navigate to the directory containing the unzipped MS Access SSURGO template database, if necessary, and open the database by double clicking on the file name.

5. When an empty SSURGO template is opened, the Import form is automatically displayed. In the textbox on this form, enter the fully qualified pathname of the directory containing the soil tabular data that you wish to import, e.g.:

C:\Downloads\soil_ne079\tabular

After entering the pathname, click OK. The import process can take anywhere from less than a minute to several minutes. The time depends on the amount of data to be imported. The amount of tabular data associated with a survey area can vary dramatically from survey area to survey area.

The Import dialog doesn't currently provide a browse capability, so the pathname has to be manually entered. I find it easiest to navigate to the directory containing the soil tabular data using Windows Explorer, and then I copy the pathname in the address window. This assumes that you have "Display the full path in the address bar" checked

in the Windows Explorer Folder Options. After copying the soil tabular data directory pathname from Windows Explorer, return to the Import form and paste that pathname into the textbox, and then click "OK".

6. Once the tabular data has been imported into a SSURGO template database, it is now ready for use with Soil Data Viewer. You can now close that database. When Soil Data Viewer needs access to that data, it will automatically open that database.

Other than unzipping the original zip file you downloaded from the Soil Data Mart, there is nothing else that you need to do in order to prepare the soil spatial data for use with Soil Data Viewer.

Soil Survey 101

In order to understand what the Soil Data Viewer application does, you first need to understand some of the soil survey related terms that are used in this document.

Soil data is distributed by "soil survey area". In the majority of cases a soil survey area and a county will share the same boundary. However, it is not uncommon for a county to coincide with more than one soil survey area. More rarely, a soil survey area may encompass all of more than one county. Soil survey areas in the eastern United States tend to be smaller than soil survey areas in the western United States, but the same is true of counties. The terms "soil survey area" and "survey area" tend to be used interchangeably.

For a published soil survey area, there is always a corresponding detailed soil map. Although there is always a corresponding detailed soil map, the tabular data for a survey area is sometimes distributed before the corresponding detailed soil map is available.

The detailed soil map is composed of all of the "soil map units" that make up the survey area. A soil map unit is a set of geographic areas for which a common management strategy is suitable, at least for the principal land uses for which that soil survey was conducted. A soil map unit is typically composed of one or more noncontiguous polygons, distributed throughout the survey area. The range in size of a soil map unit varies depending on the level of detail at which the survey was conducted. In a typical survey area, which is mapped at an approximate scale of 1:24000, map units can range from approximately two acres to thousand of acres in size. A map unit is the smallest delineation that appears on a soil map. The terms "soil map unit" and "map unit" tend to be used interchangeably.

A map unit is typically composed of one or more "map unit components". A map unit component is either some kind of soil, or some kind of non-soil entity like "rock outcrop". For each component of a map unit, soil or non-soil, a percent composition is recorded. "Major" soil map unit components are named, and the name of the map unit that includes those components typically includes the names of those major components.

For example "Jefferson-Jackson complex, 1 to 3 percent slopes" is a map unit that includes major soil components named "Jefferson" and "Jackson". In addition to the major components, a map unit may include a number of minor components whose names are not reflected in the corresponding map unit name. Although map units contain components, those components are not delineated within the map unit. The terms "map unit component" and "component" tend to be used interchangeably.

A soil component typically includes a number of layers or horizons. A layer or horizon is a horizontal section of the soil with similar characteristics.

While map units themselves do have attributes, the vast majority of what we refer to as a soil attribute is an attribute of a map unit component. For a component, a number of attributes are recorded for the component as a whole, and a number of attributes are recorded for each layer or horizon that makes up that component.

Aggregation

What is "aggregation"?

This section won't make much sense unless you are familiar with the difference between soil map units and soil map unit components. For a discussion of these concepts, please see the section titled "Soil Survey 101".

The purpose of Soil Data Viewer is to create thematic soil maps. A thematic map either shows what map units may be suitable or limited for a given use, or the distribution of a particular soil property throughout some geographic area. The smallest delineation in a soil map is an instance of a map unit, a map unit polygon. Therefore in a thematic soil map we classify and color map unit polygons to portray the desired information. In order to do this, we have to assign a single value to each map unit in order to classify that map unit.

If the attribute in question is an attribute of a map unit, we don't have to do anything other than to classify that value. But the majority of attributes in which we are interested are attributes of a map unit component, and a map unit may be composed of more than one component. In order to create a thematic map for a component level attribute, we have to somehow come up with a single value to represent a map unit as a whole, from multiple component values. The process of reducing multiple component values to a single value to represent the corresponding map unit is what we refer to as "aggregation".

There are a variety potential schemes by which data can be aggregated. We refer to a particular scheme as an "aggregation method". For most attributes, Soil Data Viewer will suggest a default aggregation method but allow you to select from other valid alternatives.

Aggregation Method Descriptions

No Aggregation Necessary

The majority of soil attributes are associated with a component of a map unit, and such an attribute has to be aggregated to the map unit level before a thematic map can be rendered. Map units, however, also have their own attributes. An attribute of a map unit does not have to be aggregated in order to render a corresponding thematic map. Therefore, the "aggregation method" for any attribute of a map unit is referred to as "No Aggregation Necessary".

Dominant Condition

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Dominant Component

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Weighted Average

The aggregation method "Weighted Average" computes a weighted average value for all components in the map unit. Percent composition is the weighting factor.

The result returned by this aggregation method represents a weighted average value of the corresponding attribute throughout the map unit.

All Components

The aggregation method "All Components" returns the lowest or highest attribute value among all components of the map unit, depending on the corresponding "tie-break" rule. In this case, the "tie-break" rule indicates whether the lowest or highest value among all components should be returned. For this aggregation method, percent composition ties cannot occur.

The result returned by this aggregation method represents either the minimum or maximum value of the corresponding attribute throughout the map unit. The result may well be based on a map unit component of very minor extent.

Least Limiting

The aggregation method "Least Limiting" is suitable only for attributes that correspond to a programmatically generated soil interpretation. Such an interpretation attempts to determine if a soil is suitable for a particular use. The results for such an interpretation can be ranked from least limiting (or most suitable) to most limiting (or least suitable). For this aggregation method, the least limiting result among all components of the map unit is returned.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit. The result may well be based on the limitations of a map unit component of very minor extent. If one were making a decision based on this result, that decision would be based on the least conservative, or most optimistic, result.

Most Limiting

The aggregation method "Most Limiting" is suitable only for attributes that correspond to a programmatically generated soil interpretation. Such an interpretation attempts to determine if a soil is suitable for a particular use. The results for such an interpretation can be ranked from least limiting (or most suitable) to most limiting (or least suitable). For this aggregation method, the most limiting result among all components of the map unit is returned.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit. The result may well be based on the limitations of a map unit component of very minor extent. If one were making a decision based on this result, that decision would be based on the most conservative, or most pessimistic, result.

Absence/Presence

The aggregation method "Absence/Presence" returns a value that indicates if, for all components of a map unit, a condition is always present, never present, partially present, or whether the condition's presence or absence is unknown. The exact phrases used for a particular attribute may vary from what is shown below.

"Always present" means that the corresponding condition is present in all of a map unit's components.

"Never present" means that the corresponding condition is not present in any of a map unit's components.

"Partially present" means that the corresponding condition is present in some but not all of a map unit's components, or that the presence or absence of the corresponding condition cannot be determined for one or more components of the map unit.

"Unknown presence" means that for components where presence or absence can be determined, the corresponding condition is never present, but the presence or absence of the corresponding condition cannot be determined for one or more components.

The result returned by this aggregation method quantifies the degree to which the corresponding condition is present throughout the map unit.

Horizon Aggregation

 "Aggregation" is the term we use to describe the process of reducing a set of component values down to a single value to represent the corresponding map unit as a whole. When we say "aggregation", without any qualifiers, we mean "component aggregation". Horizon aggregation is a similar concept.

Horizon aggregation is a sub-process of the component aggregation process. Horizon aggregation typically needs to be performed under the following circumstance:

1. The soil property being aggregated is an attribute of a soil horizon or layer.

2. The soil property being aggregated is a numeric attribute.

3. The corresponding layer option is either "Depth Range" or "All Layers".

A component is typically composed of multiple soil horizons. For an attribute of a soil horizon, one has to specify some sort of depth qualification to indicate how much of the soil profile should be considered. When the depth qualification encompasses more than one soil horizon, we typically have to reduce a set of horizon values down to a single value to represent the corresponding component as a whole. We refer to this process as "horizon aggregation".

Depth qualification can be specified in three different ways:

1. Surface Layer – The soil attribute value for the surface horizon serves as the value for the corresponding component. In this case there is only one value, therefore horizon aggregation does not have to be performed.

2. Depth Range – An upper and lower depth must be specified, in addition to units of measure (centimeters or inches). In this case, the specified depth range may encompass all or part of more than one soil horizon, in which case horizon aggregation would need to be performed.

3. All Layers – All soil horizons (the entire soil profile) are considered. Horizon aggregation would potentially need to be performed for any component with more than one soil horizon. It is rare for a component to have only one soil horizon.

When horizon aggregation is performed, a weighted average of the corresponding soil property is computed, where layer thickness is the weighting factor. The term layer thickness is appropriate because when a depth range is specified, that depth range may include only part of some soil horizons. Let's look at the following example.

A component has three horizons. The soil attribute in question is "Percent Clay". The depth qualification is specified as "Depth Range", 0 to 75 cm.

Horizon Upper Depth	Horizon Lower Depth	Percent Clay
0 cm	25 cm	15
25 cm	60 cm	25
60 cm	100 cm	30

So horizon aggregation needs to be performed because all of the first two horizons and part of the third horizon are included. The percent clay value returned for this component would be computed as follows:

$(25/75)*15 + (35/75)*25 + (15/75)*30 = 23$

The first horizon contributes 33% of the total depth (25/75), the second horizon contributes 47% of the total depth (35/75), and the last horizon contributes 20% of the total depth (15/75).

Horizon aggregation is performed only for those horizons that share some coincidence with either the implied depth range (depth qualifier = "All Layers") or the user specified depth range (depth qualifier = "Depth Range"). All contiguous preceding or trailing horizons in that set of horizons, where the corresponding value of the attribute being aggregated is null, are excluded from horizon aggregation.

For example, consider the following component. The soil attribute in question is "Percent Clay".

Horizon Upper Depth	Horizon Lower Depth	Percent Clay
0 cm	25 cm	null
25 cm	50 cm	9
50 cm	75 cm	null

75 cm	100 cm	12
100 cm	125 cm	null

When the depth qualification is "All Layers", the implied depth range is 0 to 125 cm. Only the middle three horizons will participate in horizon aggregation. The first and fifth horizons are excluded because they are either preceding or trailing horizons that share some coincidence with the implied depth range, and the corresponding value of percent clay for those horizons is null. The third horizon is included in horizon aggregation, even though the corresponding value of percent clay is null, because that horizon is not a preceding or trailing horizon within the implied depth range where the corresponding value of the attribute being aggregated is null. Therefore the total depth of the soil profile that is included in horizon aggregation is 100 – 25 = 75 cm. The percent clay value returned for this component would be computed as follows:

(25/75)*9 + (25/75)*null + (25/75)*12 = 7

Had the depth qualification been "Depth Range 0 – 75 cm", only the second horizon would have been included in horizon aggregation, and the percent clay value returned for this component would be 9.

The rule about excluding all contiguous preceding or trailing horizons where the value of the attribute being aggregated is null typically excludes horizons at the bottom of a depth range that correspond to bedrock.

Running Soil Data Viewer Standalone

To run Soil Data Viewer standalone (independent of ArcMap), start the application from the USDA program group in your start menu. All of the features and capabilities that are available when running Soil Data Viewer standalone are also available when running Soil Data Viewer as a plug-in under ArcMap.

When running Soil Data Viewer standalone you can select a soil property or soil interpretation and perform aggregation for a selected set of map units, but you are limited to viewing those results in a report. Thematic maps can only be generated when running Soil Data Viewer under ArcMap.

Application Startup

When you start Soil Data Viewer, if you have not previously selected a valid soil database to work with, you will have to do so. If you have selected a valid soil database in a previous session, that database will serve as the default soil database for the next session, and you will not be prompted to select a soil database.

What constitutes a valid soil database? A valid soil database is a SSURGO template database where the Soil Data Viewer tables are defined (template database version 32 or greater) and are also currently populated. In addition, soil tabular data for at least one survey area must have already been imported into the database. For more details on obtaining and preparing soil data for use with Soil Data Viewer, please see the section titled "What data do I need to run Soil Data Viewer?". Unless you have done something especially creative with your soil database, the Soil Data Viewer application will not let you select an invalid soil database.

Generating an Aggregation Report

The basic task of the Soil Data Viewer application is to aggregate map unit component values for a selected soil attribute into a single value to represent the corresponding map unit as a whole, for a selected set of map units. The primary reason for doing this is to be able to create a thematic map for the selected soil attribute. When running Soil Data Viewer standalone, you cannot create a thematic map, but you can still view the results of the aggregation process in what we refer to as an "aggregation report". Here are the typical steps to follow in order to generate an aggregation report. The first two steps may be performed in either order.

1. Select a soil interpretation or soil property from the Attribute Folders tab. Review and set the corresponding rating options as desired on the Rating Options tab. Keep in mind that which soil attributes are currently available and which rating options are currently editable depend on whether Soil Data Viewer is currently in Basic Mode or Advanced Mode. For a discussion of the difference between Basic Mode and Advance Mode, please see the section titled "Basic Mode versus Advanced Mode". For additional details about the various rating options, please see the section titled "Rating Options Tab".

2. Select the desired aggregation report options and select the map units to be included in the aggregation report from the map unit table on the Report Options tab. For additional details about aggregation report options and using the map unit table on the Report Options tab, please see the section titled "Report Options Tab".

3. Click "Aggregation Report". If all required options have been specified correctly, and Adobe Reader has been installed on your PC, an aggregation report will be generated. This report, in PDF format, will be displayed in a new window. Controls associated with this new window provide the option to page up and down, zoom in and out, pan, print the report or save the report to a file. For a detailed description of the contents of an aggregation report, please see the section titled "Aggregation Report".

Generating a Map Unit Description Report

The Soil Data Viewer application includes a report that displays a brief description of each of the major soil components of a map unit. Major non-soil components are identified, but no corresponding description is included. Minor map unit components are excluded from this report. Each description is generated from the underlying tabular data, and includes a variety of soil attributes.

To generate a map unit description report, first select the map units to be included in the report from the map unit table on the Report Options tab. For additional details about using the map unit table on the Report Options tab, please see the section titled "Report Options Tab". This report has no options other than selecting which map units should be included.

After selecting the map units to be included in this report, click "Map Unit Desc. Report". If Adobe Reader has been installed on your PC, a map unit description report will be generated. This report, in PDF format, will be displayed in a new window. Controls associated with this new window provide the option to page up and down, zoom in and out, pan, print the report or save the report to a file. For a detailed description of the contents of a map unit description report, please see the section titled "Map Unit Description Report".

Basic Mode versus Advanced Mode

At any given time the Soil Data Viewer application is either in Basic Mode or Advanced Mode. The option group for toggling between Basic Mode and Advanced Mode is immediately under the Attribute Folders tab, to the left of the application window.

Mode determines which soil attributes are currently available, and whether or not the advanced rating options are editable. Both the basic and advanced rating options reside on the Rating Options tab, the middle of the three overlapping tabs to the right of the application window.

In Basic Mode, most of the soil attributes that are available are what are referred to as soil interpretations. A soil interpretation implies an intended use, and the associated value indicates the degree to which a soil is suitable or unsuitable for that use. For example, Dwelling with Basements is a soil interpretation that indicates if a soil is suitable for a dwelling with a basement. In Basic Mode, an attribute typically has both basic and advanced rating options, but the advanced rating options cannot be altered when in Basic Mode. In Basic Mode, all basic rating options will typically have a default value, but the default value for any data selection option needs to be reviewed before generating an aggregation report or a thematic map.

In Advanced Mode, all soil interpretations and soil properties are available. A soil property is an intrinsic soil attribute whose value doesn't imply suitability for any given purpose. Soil properties include such things as pH, bulk density, percent clay. In Advanced Mode, an attribute typically has both basic and advanced rating options, and most of those options can be altered when in Advanced Mode. For some attributes, some of the advanced options cannot be changed, even in Advanced Mode.

Running Soil Data Viewer as a Plug-in Under ArcMap

Keep in mind that all of the features that are available when running Soil Data Viewer standalone are also available when running Soil Data Viewer as a plug-in under ArcMap. Those features are not covered again in this section. This section discusses features that are only available when running Soil Data Viewer as a plug-in under ArcMap.

To run Soil Data Viewer as a plug-in under ArcMap, you must first start ArcMap.

The first time you start ArcMap after installing Soil Data Viewer, you will need to add the Soil Data Viewer toolbar to ArcMap. The Soil Data Viewer "toolbar" consists of a single button. To add the Soil Data Viewer toolbar, right click somewhere in a clear area of the ArcMap toolbar or menu bar, and from the list that appears, select "Soil Data Viewer Tools". You may have to drag the newly added toolbar to anchor it.

After starting ArcMap, the next thing you would typically do is to load the soil map unit polygon layer that will be used to control which map units should be included in a thematic map. While you can load more than one soil map unit polygon layer into ArcMap, at any given moment, one and only one soil map unit polygon layer controls which map units are included in a thematic map. How you indicate which soil map unit polygon layer will be used for this purpose will be discussed shortly.

A soil map unit polygon layer is included as part of the spatial data associated with a survey area, but only when spatial data for a survey area is available. For details about how to obtain this data, please see the section titled "What data do I need to run Soil Data Viewer?". Remember that the soil map unit polygon layer's file name will be something like "soilmu_a_ne079.shp", where the survey area portion of the name, "ne079", indicates the corresponding soil survey area.

You can load the soil map unit polygon layer into ArcMap before or after starting the Soil Data Viewer plug-in, but you won't be able to generate a thematic map until such a layer has been loaded and selected.

Keep in mind that in order to generate a thematic map, your soil spatial data and soil tabular data must correspond to the same survey area. Because these two data sources are loaded independently, it is possible for there to be no correspondence between the soil

spatial data and the soil tabular data you are currently using. When this occurs, "synchronization" will fail in whole or part. The concept of synchronization is discussed in the section titled "Synchronization".

After starting ArcMap, when you are ready, click the Soil Data Viewer tool button to start Soil Data Viewer as a plug-in under ArcMap.

Application Startup

Specifying a Valid Soil Database

When you start Soil Data Viewer, if you have not previously selected a valid soil database to work with, you will have to do so. If you have selected a valid soil database in a previous session, that database will serve as the default soil database for the next session, and you will not be prompted to select a soil database.

What constitutes a valid soil database? A valid soil database is a SSURGO template database where the Soil Data Viewer tables are defined (template database version 32 or greater) and are also currently populated. In addition, soil tabular data for at least one survey area must have already been imported into the database. For more details on obtaining and preparing soil data for use with Soil Data Viewer, please see the section titled "What data do I need to run Soil Data Viewer?". Unless you have done something especially creative with your soil database, the Soil Data Viewer application will not let you select an invalid soil database.

Specifying a Valid Soil Map Layer

When you start Soil Data Viewer as a plug-in under ArcMap, the application will check if you have already loaded a valid soil map unit polygon layer that can be used to control which map units are included in a thematic map. This map layer is also referred to as the "controlling soil map layer" and sometimes as just "the soil map layer". At any given moment, more than one such layer may be loaded into ArcMap. Any valid soil map unit polygon layer is referred to as a candidate soil map layer.

If there are no candidate soil map layers currently loaded into ArcMap when Soil Data Viewer starts up, a warning will be issued, but Soil Data Viewer will remain open. You will not be able to generate an aggregation report or a thematic map until a valid soil map layer has been loaded into ArcMap and a valid soil map layer has been selected from within Soil Data Viewer. Soil map unit polygon layers can still be loaded into ArcMap after starting Soil Data Viewer. To select a soil map layer to serve as the controlling soil map layer, or to change the current controlling soil map layer, click the button in Soil Data Viewer that opens the Select Soil Map Layer dialog.

If there are one or more candidate soil map layers loaded into ArcMap when you start Soil Data Viewer, a dialog with a list of all candidate soil map layers will be displayed, allowing you to specify which candidate soil map layer should serve as the controlling soil map layer. If you do not select one of these candidate soil map layers to serve as the controlling soil map layer, Soil Data Viewer will remain open but you will not be able to generate an aggregation report or a thematic map until a valid soil map layer has been selected from within Soil Data Viewer.

What constitutes a valid Soil Map Layer? For this release of Soil Data Viewer, a valid soil map layer satisfies the following conditions:

> 1. The layer is a polygon feature class of type "Polygon", as opposed to "Polygon M" or Polygon "Z" or "Polygon ZM".
>
> 2. The source of the layer is a shape file. ArcInfo coverages and Geodatabases are not supported at this time.
>
> 3. The associated feature attribute table contains a column named "musym" whose logical data type is "character(6)", and a column named "mukey" whose logical data type is "character(30)".

The name of the soil map layer doesn't matter.

A thematic map layer created by Soil Data Viewer does not meet the above criteria because the source of such a layer is not a shape file. Therefore, a thematic map layer created by Soil Data Viewer cannot serve as a controlling soil map layer. When explicitly selecting map unit polygons to be included in a thematic map, please remember that those polygons must be selected from the controlling soil map layer.

Sometime in 2004 the soil map standard was changed to allow line and point map units. This version of Soil Data Viewer can only deal with polygon map units. Line and point map units will be accommodated in a future release.

Generating a Thematic Map

The basic task of the Soil Data Viewer application is to aggregate map unit component values for a selected soil attribute into a single value to represent the corresponding map unit as a whole, for a selected set of map units. The primary reason for doing this is to be able to create a thematic map for the selected soil attribute. Here are the typical steps to follow in order to generate a thematic map. The first two steps may be performed in either order.

1. Select a soil interpretation or soil property from the Attribute Folders tab. Review and set the corresponding rating options as desired on the Rating Options tab. Keep in mind that which soil attributes are currently available and which rating options are currently

editable depend on whether Soil Data Viewer is currently in Basic Mode or Advanced Mode. For a discussion of the difference between Basic Mode and Advance Mode, please see the section titled "Basic Mode versus Advanced Mode". For additional details about the various rating options, please see the section titled "Rating Options Tab".

2. Select the map units to be included in the thematic map. Only those map units that are either explicitly or implicitly selected will be included in the thematic map. If one or more map units in the soil map layer are explicitly selected, only those explicitly selected map units will be included in the thematic map. If no map units in the soil map layer are explicitly selected, then ALL map units in the soil map layer are then considered to be implicitly selected. This provides a quick way to "select" all map units without having to explicitly select all map units.

Selecting which map units should be included in a thematic map is controlled by selecting map units in the controlling soil map layer, from within ArcMap, as opposed to from within Soil Data Viewer. This is different from selecting which map units should be included in an aggregation report. Selecting which map units should be included in an aggregation report is done through the map unit table on the Report Options tab from within Soil Data Viewer itself.

Which map units are selected in the map unit table on the Report Options tab has no bearing on which map units are included in a thematic map. Which map units are currently selected in the controlling soil map layer in ArcMap does influence which map units appear in the map unit table on the Report Options tab within Soil Data Viewer, because this table will never include any map units that were not currently selected in the controlling soil map layer in ArcMap, at the last point at which synchronization was performed.

Map unit polygons are explicitly selected and deselected by using the features provided by ArcMap. Clicking on a map unit polygon with the Select Features tool explicitly selects that map unit polygon. To explicitly select additional map unit polygons, click on each additional map unit polygon using the Select Features tool with the Shift key pressed. Clicking on a map unit polygon with the Select Features tool, when the Shift key is pressed also toggles the selection status of that map unit polygon. All map unit polygons can be deselected at once by selecting "Clear Selected Features" from the Selection menu. All polygons for one or more specified map units may also be explicitly selected by using "Select by Attributes" from ArcMap's Selection menu.

3. After selecting a soil attribute and setting the desired rating options, and selecting the map units to be included in the thematic map, click "Map". If all required rating options have been specified correctly, and as long as there are some map units in common between those selected in ArcMap and those that exist in the underlying soil database, a thematic map will be generated. When the map is generated the focus will return to ArcMap.

4. If you explicitly selected one or more map unit polygons before generating a thematic map, and if the controlling soil map layer in the Table of Contents frame within ArcMap is currently selected, the selection lines of those explicitly selected map unit polygons will be visible in the output thematic map, obscuring parts of the map. To see the thematic map clearly, uncheck the selection box for the controlling soil map layer in the Table of Contents frame within ArcMap. The controlling soil map layer does not have to be selected in order for it to serve as the controlling soil map layer.

If no map unit polygons were explicitly selected before generating a thematic map, there won't be any selection lines obscuring parts of the map, even when the controlling soil map layer is currently selected.

For additional information about the thematic map itself, please see the section titled "Thematic Map".

Synchronization

Soil Data Viewer, when running under ArcMap, requires both soil spatial data and soil tabular data. The soil spatial data must be manually loaded into ArcMap. The soil tabular data resides in the underlying soil database that had to be specified or known when the SDV plug-in starts up. In general the soil spatial data should contain the same set of map units that exist in the corresponding tabular data. But since these two data sources are loaded independently, there may or may not be any map units in common.

When there are no map units in common between the set of map units currently selected in the soil spatial data and those in the underlying soil database, no aggregation report or thematic map can be generated. So periodically, Soil Data Viewer, when running under ArcMap, has to check to see if there are still any map units in common before performing a function like generating a thematic map. The process of determining if there are any map units in common between the set of map units currently selected in the soil spatial and those in the tabular data is referred to as "synchronization".

Changing which map units are currently selected in the soil map layer, changing the current controlling soil map layer or changing the underlying soil database all affect the outcome of the synchronization process.

When is synchronization performed?

Synchronization is automatically performed when any of the following events occur.

1. Soil Data Viewer application startup.

2. The current soil database is changed.

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3. A controlling soil map layer is established, or the current controlling soil map layer is changed.

4. The current controlling soil map layer is unloaded from ArcMap while Soil Data Viewer is running.

5. The "Map" button is clicked.

Since a thematic map cannot be created when there are no map units in common between those map units currently selected in the soil map layer and those map units that exist in the underlying soil database, synchronization is automatically performed whenever the "Map" button is clicked. Depending on the outcome of the synchronization process a thematic map may or may not be generated.

Synchronization can also be invoked on demand by clicking the "Synchronize" button.

What synchronization states are defined?

At the end of the synchronization process, one of the five following states will exist.

1. A valid soil map layer is currently selected and all map units that are explicitly or implicitly selected in ArcMap have a counterpart in the current soil database.

2. A valid soil map layer is currently selected but only some of the map units that are explicitly or implicitly selected in ArcMap have a counterpart in the current soil database.

3. A valid soil map layer is currently selected and none of the map units that are explicitly or implicitly selected in ArcMap have a counterpart in the current soil database.

4. One or more valid soil map layers are loaded into ArcMap, but no valid soil map layer is currently selected.

5. No valid soil map layer is currently loaded into ArcMap.

If synchronization is triggered by clicking "Map" and the outcome of synchronization is state 1, a thematic map will be generated.

If synchronization is triggered by clicking "Map" and the outcome of synchronization is state 2, you will be asked if you wish to continue with map generation. At this point you should be concerned as to why only some of the map units currently selected in your soil map layer have a counterpart in the current soil database. This indicates some level of disconnect between the soil spatial and tabular data you are currently using.

If synchronization is triggered by clicking "Map" and the outcome of synchronization is state 3, 4 or 5, map generation will be aborted.

The outcome of the last synchronization is reflected by the synchronization status related controls towards the bottom of the Soil Data Viewer application window (when running under ArcMap). For additional details, please see the section titled "Synchronization Status Related Controls".

Creating Thematic Maps for more than one Survey Area at a Time

Soil data is distributed by soil survey area. If you want to run Soil Data Viewer for a single survey area, as distributed, no special data preparation beyond that already described in this document is required. But if you want to run Soil Data Viewer for all or parts of more than one survey area, spatial and tabular data for those survey areas must be merged before processing that data with Soil Data Viewer. The reason for this is that Soil Data Viewer can only deal with one soil map layer at a time. This is why when you have more than one candidate soil map layer loaded into ArcMap, you are required to specify which of those soil map layers should serve as the controlling soil map layer.

Soil tabular data can be merged in a couple of ways. You can import data for more than one survey area into the same SSURGO template database, but you are limited to importing data for one survey area at a time. This is the recommended way to merge soil tabular data. From within a SSURGO template database, you can also import the soil tabular data contained within a different SSURGO template database by running the macro named "Access External Soil Database". Detailed instructions for importing data into a SSURGO template database are available in the report titled "How to Understand and Use this Database", which can be found under the Reports tab in any SSURGO template database.

Merging soil spatial data can be done using ArcMap. For detailed help on merging layers in ArcMap, open help in ArcMap and look for a topic named "Merging Layers". The exact steps for merging layers in ArcMap may vary from version to version of ArcGIS. This document doesn't cover processes particular to ArcMap in detail.

Other Map Layers

When running Soil Data Viewer under ArcMap, you may have any number of layers loaded into ArcMap at any given instant. When running Soil Data Viewer it is common to load the ortho-photography background for your area of interest. You may wish to load additional layers to help you locate your area of interest. Many of these additional layers of interest are available from the USDA Geospatial Data Gateway at http://datagateway.nrcs.usda.gov.

Soil Data Viewer Output

Soil Data Viewer produces only three different outputs, an aggregation report, a map unit description report and a thematic map. An aggregation report and a map unit description report are always available no matter how you are running Soil Data Viewer. A thematic map is only available when running Soil Data Viewer as a plug-in under ArcMap.

Aggregation Report

Below is the first page of a sample aggregation report.

T Factor

Units of Measure: tons per acre per year
Aggregation Method: Dominant Condition
Tie-break Rule: Lower
Interpret Nulls as Zero: No

Medina County, Texas
Survey Area Version and Date: 2 - 10/12/2004

Map symbol	Map unit name	Rating
AmA	AMPHION CLAY LOAM, 0 TO 1 PERCENT SLOPES	5
AmB	AMPHION CLAY LOAM, 1 TO 3 PERCENT SLOPES	5
AtA	ATCO LOAM, 0 TO 1 PERCENT SLOPES	5
AtB	ATCO LOAM, 1 TO 3 PERCENT SLOPES	5
AuC	AUSTIN SILTY CLAY, 1 TO 5 PERCENT SLOPES	3
BKD	BRACKETT ASSOCIATION, UNDULATING (KERRVILLE)	2
BRF	BRACKETT-ROCK OUTCROP ASSOCIATION, HILLY (KERRVILLE-ROCK OUTCROP)	2
CdA	CAID SANDY CLAY LOAM, 0 TO 1 PERCENT SLOPES	5
CdB	CAID SANDY CLAY LOAM, 1 TO 3 PERCENT SLOPES	5
CdC	CAID SANDY CLAY LOAM, 3 TO 5 PERCENT SLOPES	5
CsA	CASTROVILLE CLAY LOAM, 0 TO 1 PERCENT SLOPES	5
CsB	CASTROVILLE CLAY LOAM, 1 TO 3 PERCENT SLOPES	5
DED	DEVINE ASSOCIATION, UNDULATING	4
DNC	DINA ASSOCIATION, GENTLY UNDULATING	2
Do	DIVOT CLAY LOAM, OCCASIONALLY FLOODED	5
Dp	DIVOT CLAY LOAM, FREQUENTLY FLOODED	5
DSC	DOSS ASSOCIATION, GENTLY UNDULATING	2
DuA	DUVAL FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES	4
DuB	DUVAL FINE SANDY LOAM, 1 TO 3 PERCENT SLOPES	4
DwC	DUVAL LOAMY FINE SAND, 0 TO 5 PERCENT SLOPES	4
HaA	HANIS SANDY CLAY LOAM, 0 TO 1 PERCENT SLOPES	5
HaB	HANIS SANDY CLAY LOAM, 1 TO 3 PERCENT SLOPES	5
HNC	HINDES ASSOCIATION, GENTLY UNDULATING	4
KAD	KAVETT-TARRANT ASSOCIATION, UNDULATING	1
KcF	KINCHELOE SOILS, 10 TO 30 PERCENT SLOPES	3
KnA	KNIPPA CLAY, 0 TO 1 PERCENT SLOPES	5
KnB	KNIPPA CLAY, 1 TO 3 PERCENT SLOPES	5
LaC	LACOSTE SOILS, 1 TO 5 PERCENT SLOPES	2
McA	MERCEDES CLAY, 0 TO 1 PERCENT SLOPES (MONTELL)	5
McB	MERCEDES CLAY, 1 TO 3 PERCENT SLOPES (MONTELL)	5
MeB	MERETA CLAY, 1 TO 3 PERCENT SLOPES (STEPHEN)	2
MgA	MIGUEL FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES	5
MgB	MIGUEL FINE SANDY LOAM, 1 TO 3 PERCENT SLOPES	5
MhA	MIGUEL SOILS, FREQUENTLY FLOODED, 0 TO 1 PERCENT SLOPES (POTEET)	5
MnC	MONTEOLA CLAY, 1 TO 5 PERCENT SLOPES	5
MoC	MONTEOLA GRAVELLY CLAY, 1 TO 5 PERCENT SLOPES	5

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Standard Contents

Page Header

The name of the soil attribute to which the report pertains serves as the page title.

Immediately under the page title is a summary of the rating options that were specified prior to generating the report.

Page Body

An aggregation report may include data for more than one survey area, but data for more than one survey area is never printed on the same page. In other words, a page always contains data for one and only one soil survey area, but the data for a survey area may span multiple pages.

At the top of the page body is the name of the corresponding soil survey area, center justified. Immediately under the survey area name is the corresponding survey area version and date, center justified.

Under that are the aggregation results for the selected soil attribute, for those map units in that survey area that were selected to be included in the report.

A map unit is identified by its corresponding map unit symbol, which is displayed in the column labeled "Map symbol". Within a particular soil survey area, map unit symbol is unique.

Immediately to the right of the map unit symbol is the corresponding map unit name.

The last column in the body of the report is labeled "Rating". This value is the value of the selected soil attribute that was derived to represent the corresponding map unit as a whole. In other words, this column corresponds to the aggregated value of the soil attribute identified in the page title.

Page Footer

The page footer identifies the version of the Soil Data Viewer application that was used to produce the corresponding results.

Rating Options Report Option

When this option is checked, all rating options, with their corresponding description, are included at the end of an aggregation report. These are the same rating options that

appear in the page header in other pages of an aggregation report. Checking this option simply provides some additional explanation of a rating option. Below is a sample rating options page.

T Factor

Rating Options

Attribute Name: T Factor

The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Units of Measure: tons per acre per year

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value to represent the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity; e.g., rock outcrop. The components in the map unit name represent the major soils within a map unit delineation. Minor components make up the balance of the map unit. Great differences in soil properties can occur between map unit components and within short distances. Minor components may be very different from the major components. Such differences could significantly affect use and management of the map unit. Minor components may or may not be documented in the database. The results of aggregation do not reflect the presence or absence of limitations of the components which are not listed in the database. An on-site investigation is required to identify the location of individual map unit components.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be generated.

aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

which value should be selected from a set of multiple candidate values, or which value should be percent composition tie.

Tie-break Rule: Lower

The tie-break rule indicates selected in the event of a p

null value for a component should be converted to zero before aggregation occurs. This will be done st one component where this value is not null.

Interpret Nulls as Zero: No

This option indicates that a only if a map unit has at lea

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Component Breakdown and Rating Reasons Report Option

This report option is only available when the corresponding soil attribute is a programmatically generated soil interpretation. A soil interpretation indicates the degree to which a soil is limited or suitable for a given use. In addition to an overall rating, reasons for that rating are typically stored along with the overall rating.

The tabular soil data includes both manually entered soil interpretations and programmatically generated soil interpretations. Manually entered soil interpretations are handled differently from programmatically generated soil interpretation due to differences in how these two kinds of soil interpretations are stored in the database.

Unfortunately there is nothing that indicates when a soil attribute represents a programmatically generated soil interpretation, other than the fact that this option becomes available.

When this option is available and checked, additional information is included in the aggregation report. Below is a sample page of an aggregation report where this option has been checked.

Camp Areas

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Medina County, Texas
Survey Area Version and Date: 2 - 10/12/2004

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
AmA	AMPHION CLAY LOAM, 0 TO 1 PERCENT SLOPES	Not limited	AMPHION 90%
AmB	AMPHION CLAY LOAM, 1 TO 3 PERCENT SLOPES	Not limited	AMPHION 90%
AtA	ATCO LOAM, 0 TO 1 PERCENT SLOPES	Not limited	ATCO 85%
AtB	ATCO LOAM, 1 TO 3 PERCENT SLOPES	Not limited	ATCO 90%
AuC	AUSTIN SILTY CLAY, 1 TO 5 PERCENT SLOPES	Somewhat limited	AUSTIN 90% Too clayey
BKD	BRACKETT ASSOCIATION, UNDULATING (KERRVILLE)	Somewhat limited	BRACKETT (KERRVILLE) 71% Too Stony
BRF	BRACKETT-ROCK OUTCROP ASSOCIATION, HILLY (KERRVILLE-ROCK OUTCROP)	Very limited	BRACKETT (KERRVILLE) 64% Slope
CdA	CAID SANDY CLAY LOAM, 0 TO 1 PERCENT SLOPES	Not limited	CAID 80%
CdB	CAID SANDY CLAY LOAM, 1 TO 3 PERCENT SLOPES	Not limited	CAID 90%
CdC	CAID SANDY CLAY LOAM, 3 TO 5 PERCENT SLOPES	Not limited	CAID 90%
CsA	CASTROVILLE CLAY LOAM, 0 TO 1 PERCENT SLOPES	Not limited	CASTROVILLE 85%
CsB	CASTROVILLE CLAY LOAM, 1 TO 3 PERCENT SLOPES	Not limited	CASTROVILLE 85%
DED	DEVINE ASSOCIATION, UNDULATING	Very limited	DEVINE 70% Gravel content
DNC	DINA ASSOCIATION, GENTLY UNDULATING	Very limited	DINA 70% Too Stony Gravel content
Do	DIVOT CLAY LOAM, OCCASIONALLY FLOODED	Very limited	DIVOT 80% Flooding Too clayey
Dp	DIVOT CLAY LOAM, FREQUENTLY FLOODED	Very limited	DIVOT 80% Flooding Too clayey
DSC	DOSS ASSOCIATION, GENTLY UNDULATING	Very limited	DOSS 65% Depth to bedrock
DuA	DUVAL FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES	Not limited	DUVAL 75%
DuB	DUVAL FINE SANDY LOAM, 1 TO 3 PERCENT SLOPES	Not limited	DUVAL 80%
DwC	DUVAL LOAMY FINE SAND, 0 TO 5 PERCENT SLOPES	Somewhat limited	DUVAL 80% Too sandy
HaA	HANIS SANDY CLAY LOAM, 0 TO 1 PERCENT SLOPES	Not limited	HANIS 85%
HaB	HANIS SANDY CLAY LOAM, 1 TO 3 PERCENT SLOPES	Not limited	HANIS 85%
HNC	HINDES ASSOCIATION, GENTLY UNDULATING	Somewhat limited	HINDES 55% Gravel content
KAD	KAVETT-TARRANT ASSOCIATION, UNDULATING	Very limited	KAVETT 57% Depth to bedrock Depth to cemented pan Too Stony Too clayey TARRANT 24% Depth to bedrock Too Stony Too clayey Content of large stones
KcF	KINCHELOE SOILS, 10 TO 30 PERCENT SLOPES	Very limited	KINCHELOE 67% Slope Too clayey Restricted permeability

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In addition to the three columns normally included in an aggregation report, a fourth "column" is now included. The heading of this "column" includes the phrases "Component name and % composition" and "Rating reasons". This "column" actually includes three different attributes.

When this report option is checked, for each map unit whose rating is something other than "Not rated" (or other logical equivalents) additional information is included. This information includes the name of all components of that map unit that share the same rating as that assigned to the map unit as a whole. For each of those components, the corresponding percent composition is displayed, as well as any applicable reasons as to why that component was assigned that rating. Reasons are typically only displayed when a soil was found to be less than suitable for a particular use.

Programmatically generated soil interpretations always pertain to components, and therefore the individual component ratings have to be aggregated to come up with a single rating to represent the map unit as a whole. So for example, say we're performing a dominant component aggregation for a soil attribute named "Camp Areas". Say that map unit "ABCD" has four components, Alpha, Bravo, Charlie and Delta, at 10%, 20% 30% and 40% composition, respectively. Alpha is rated "Very limited", Bravo is rated "Somewhat limited", Charlie is rated "Not limited" and Delta is rated "Very limited".

The dominant component, at 40%, is Delta, so it's corresponding rating of "Very limited" is selected to serve as the rating for map unit ABCD as a whole. When this report option is checked, the aggregation report will also list all components of map unit ABCD whose rating for Camp Areas was "Very limited". So in this case, components Alpha and Delta would be displayed, along with the corresponding percent compositions, 10% and 40% respectively, along with the reasons that each of those components was found to be less than suitable, e.g. "too sandy", "flooding", etc. The reasons why a particular component was less than suitable for a particular use are printed under the corresponding component name, and indented slightly.

Map Unit Description Report

Below is the first page of a sample map unit description report.

Map Unit Description

Bexar County, Texas

[Minor map unit components are excluded from this report]

Map unit: AuB - Austin silty clay, 1 to 3 percent slopes

    Component: Austin (100%)

The Austin component makes up 100 percent of the map unit. Slopes are 1 to 3 percent. This component is on ridges on plains. The parent material consists of residuum weathered from chalk. Depth to a root restrictive layer, bedrock (paralithic), is 24 to 43 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R086AY109TX Clay Loam Pe 44-64 ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 55 percent.

Map unit: AuC - Austin silty clay, 3 to 5 percent slopes

    Component: Austin (100%)

The Austin component makes up 100 percent of the map unit. Slopes are 3 to 5 percent. This component is on ridges on plains. The parent material consists of residuum weathered from chalk. Depth to a root restrictive layer, bedrock (paralithic), is 24 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R086AY109TX Clay Loam Pe 44-64 ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 55 percent.

Map unit: BpC - Whitewright clay loam 1 to 5 percent slopes

    Component: Whitewright (100%)

The Whitewright component makes up 100 percent of the map unit. Slopes are 1 to 5 percent. Depth to a root restrictive layer, bedrock (paralithic), is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R086AY107TX Chalky Ridge Pe 44-64 ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 55 percent.

Map unit: BrD - Brackett gravelly clay loam, 5 to 12 percent slopes

    Component: Brackett (100%)

The Brackett component makes up 100 percent of the map unit. Slopes are 5 to 12 percent. Depth to a root restrictive layer, bedrock (paralithic), is 6 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R081CY355TX Adobe Pe 44+ ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 65 percent.

Map unit: BrE - Brackett gravelly clay loam, 12 to 20 percent slopes

    Component: Brackett (100%)

The Brackett component makes up 100 percent of the map unit. Slopes are 12 to 20 percent. Depth to a root restrictive layer, bedrock (paralithic), is 6 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R081CY362TX Steep Adobe Pe 44+ ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 65 percent.

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A map unit description report displays a brief description of each of the major soil components of a map unit. Major non-soil components are identified, but no corresponding description is included. Minor map unit components are excluded from this report, as indicated in the header on the first page of this report. Each component

description is generated from the underlying tabular data, and includes a variety of soil attributes.

A map unit description report may include data for more than one survey area, but data for more than one survey area is never printed on the same page. In other words, a page always contains data for one and only one soil survey area, but the data for a survey area may span multiple pages. Survey area name is displayed immediately under the report title.

A map unit is identified by its corresponding map unit symbol, which is displayed to the right of the label "Map Unit:". Within a particular soil survey area, map unit symbol is unique.

Immediately to the right of the map unit symbol is the corresponding map unit name.

The major components for a map unit are sorted in descending order by percent composition, i.e. the percent of the map unit typically occupied by that component. Component name and percent composition is displayed to the right of the label "Component:".

A component's description appears immediately below the component name.

In the footer of this report, survey area version and date indicate the vintage of the data included in this report. This is the same version information that occurs in the header of an aggregation report.

Thematic Map

Below is a sample thematic map, in ArcMap.
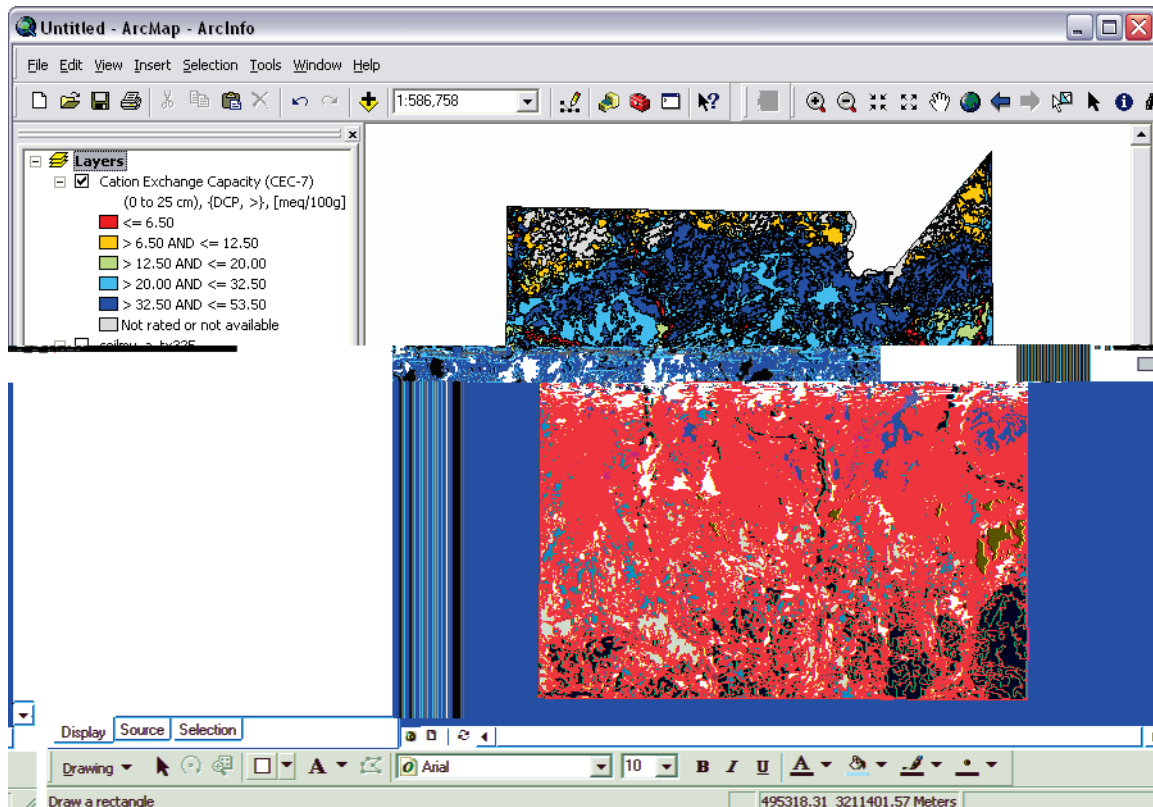
Table of Contents Frame

In a typical ArcMap session, the interface contains two major frames. The frame on the left side of the application window is the Table of Contents frame. This frame shows all layers that are currently loaded into ArcMap, with their corresponding titles and map legend. When a new thematic map is generated, the layer corresponding to that map appears at the top of the Table of Contents frame.

Deciphering the Map Legend Title

For a Soil Data Viewer thematic map, the map legend title is always split between two lines. The first line is the name of the soil attribute that is the subject of the corresponding map. The second line includes the rating options that were specified when the map was created, and the units of measure for the corresponding soil attribute, if any. Below are some sample map legend titles.

Potential Irrigated Crop Yield
   (Corn/Bu), {WA, >, null = 0}

Depth to Water Table
   (Jan to Dec), {DCD, <}, [cm]

Cation Exchange Capacity (CEC-7)
   (0 to 25 cm), {DCP, >}, [meq/100g]

Depth to Soil Restrictive Layer
   (Bedrock (lithic), 5% cutoff), {DCD, <}, [cm]

Camp Areas
   {DCD, >}

T Factor
   {DCD, <}, [tons/acre/yr]

The second line of the map legend title is composed of one to three sections, depending on the corresponding soil attribute.

The optional section delimited by () includes any qualifiers necessary to completely identify what data was evaluated in order to produce the corresponding thematic map. Some soil attributes defined in Soil Data Viewer do not correspond to a specific soil attribute in the underlying soil database. For example, the attribute "Depth to Soil Restrictive Layer" doesn't indicate a specific kind of restrictive layer.

In order to relate one of these non-specific Soil Data Viewer attributes to a specific attribute in the underlying soil database, additional qualifiers are required. These additional qualifiers are specified at run time, immediately before aggregation is performed. Qualifiers may include data selection constraints or month range constraints or depth qualifier constraints. A component percent cutoff constraint may limit which components are actually considered in the aggregation process.

The section delimited by {} indicates the options in effect when the data was evaluated. This section will always be present. The first item in this group is an acronym that indicates the aggregation method (see below). The second item in this group indicates the tie-break rule, where "<" corresponds to "select the lower value" and ">" corresponds to "select the higher value". The optional third item in this group, "null = 0", when present, indicates that null attribute values conditionally may have been converted to zero when this data was evaluated.

Acronym	Aggregation Method
DCD	Dominant Condition
DCP	Dominant Component
ML	Most Limiting
LL	Least Limiting
WA	Weighted Average
ACP	All Components
AP	Absence/Presence
NAN	No Aggregation Necessary

The optional section delimited by [] indicates the units of measure for the corresponding soil attribute, if any. For crop yield soil attributes, the units of measure are specified in the section delimited by (), rather than in this section.

Understanding the Map Legend

A map legend typically consists of two or more map legend classes. Each map legend class is represented by a particular color and a class label. The class label describes which rating values are included in that map legend class. For attributes whose values can be logically ordered, the corresponding map legend classes are typically logically ordered. For an attribute that cannot be logically ordered, the map legend classes are typically ordered alphabetically.

Kinds of Map Legends

Map legends fall into two broad categories, classes and unique values. A class map legend is typically used for continuous numeric attributes. In a class map legend each map legend class represents a range of result values, and the individual map legend classes are typically ordered in ascending order. A class map legend reflects all result values that occurred during the generation of the corresponding map, but may or may not reflect all possible result values.

Below is a sample natural break classes map legend.
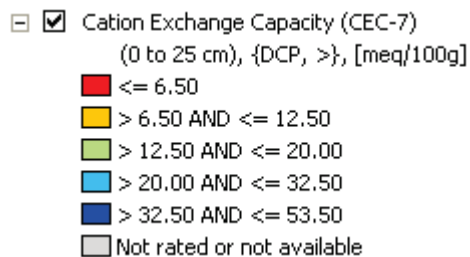
The other type of map legend is a unique values map legend. In a unique values map legend, there is a map legend class for every distinct result value. A unique values map legend reflects all result values that occurred during the generation of the corresponding map, but may or may not reflect all possible result values. There are variants of unique values legends where more than one result value may be grouped into the same map legend class.

Below is a sample unique values map legend.
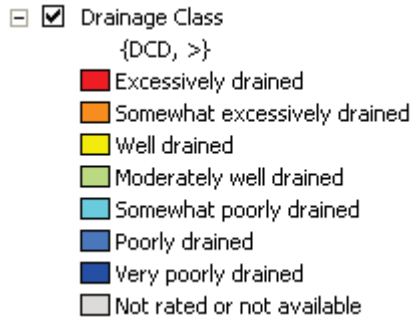
For some soil attributes, the map legend classes are predefined rather than determined at run time. For such an attribute the map legend may reflect all possible result values, even though not all of those values may not be reflected in the results for the current map. Unfortunately, there is nothing that indicates when a map legend reflects only those values that exist for the current map or when a map legend reflects all possible values. The map legend typically reflects all possible values for soil attributes whose allowable values are restricted to a relative small set of possible values, or for continuous numeric soil attributes whose values tend to be grouped into standard classes. This group of attributes includes soil interpretations and soil properties with fixed domains.

Unclassified Map Units

When generating a thematic map, it may not be possible to assign a map unit to any map legend class because that map unit's rating value was null or was some other non-null value that signifies that the corresponding map unit could not be classified. For example, when a soil interpretation cannot be derived for a particular map unit component due to insufficient data, the soil interpretation rating class for that component is typically set to "Not rated" rather than null. A map unit may not be able to be rated for a particular soil interpretation simply because that interpretation was not run for the corresponding survey area. A map unit may not be able to be rated for a particular crop yield because a yield for that crop was not recorded for that map unit.

All unclassified map units are grouped into the same map legend class, regardless of why those map units weren't classified. The color of this map legend class is grey, and the corresponding label is typically "Not rated or not available".

A map legend class for unclassified map units is present for most soil attributes. But for some soil attributes, a null value can reasonably be interpreted as something other than null. For example, when a flooding frequency class value is null, we typically treat that value as equivalent to "None". Another example is depth to water table. When a map unit's depth to water table rating is null we typically treat the corresponding map unit as one whose depth to water table is understood to be greater than 200 centimeters.

For attributes where a null value can reasonably be interpreted as something other than null, a map unit with a null rating value is typically grouped with the class associated

with how that null value is typically interpreted. This reclassification isn't reflected in an aggregation report, but it is reflected in a thematic map. So for Flooding Frequency Class, a map unit whose rating value is null is assigned to the map legend class whose label is "None". For Depth to Water Table, a map unit whose rating value is null is assigned to the map legend class that includes values greater than 200 centimeters. For such a soil attribute, the map legend will not include a map legend class for unclassified map units.

Data View Frame

In a typical ArcMap session, the interface contains two major frames. The frame on the right side of the application window is the Data View frame. This frame displays the consolidated map corresponding to all layers that are currently selected in the Table of Contents frame.

A Soil Data Viewer thematic map will include only those map units that were either explicitly or implicitly selected in the controlling soil map layer at the time the map was generated. The black lines in a thematic map are map unit polygon boundaries. Individual map units are colored according to their corresponding map legend class in the Table of Contents frame. All selected map units that have a counterpart in the current soil database will be assigned to a map legend class. The thematic map may contain blank areas which are either map unit polygons that were not selected prior to generating the map, map units that have no counterpart in the current soil database or regions that are not part of any soil survey area.

Dropping Temporary Thematic Map Layers

Each new thematic map you create adds a new layer to ArcMap. Each of these layers is a temporary layer that will be dropped when you exit ArcMap. During your session the accumulation of these layers may become a nuisance.

You can delete one of these temporary layers from ArcMap by right clicking on the first line of the layer title in the Table of Contents frame, and selecting "Remove". You can also remove all temporary thematic map layers from ArcMap at once by clicking the button labeled "Clear Themes" in the Soil Data Viewer application.

Saving Results

Unless you explicitly save a thematic map, that map is lost once you exit ArcMap. When saving results, you can either save only the data on which a thematic map was based, or you can save the data on which the thematic map was based as well the information that helps preserve the corresponding thematic map itself. When you save only the data on

which a thematic map was based, it may be difficult to recreate the original thematic map and corresponding map legend.

If you wish to save a thematic map, this must be done manually using the capabilities of ArcMap. This document doesn't cover processes particular to ArcMap in detail.

We DO NOT recommend saving only the data in which a thematic map was based in a shape file. In ArcGIS 8.x and later versions it appears that any null values in the original results end up being interpreted as zero when converted to a shape file. Soil Data Viewer doesn't exhibit this problem in its thematic maps because those results are stored in an ASCII file rather than in the Dbase IV (.dbf) format that a shape file uses.

Merging Results

Those of you familiar with versions of Soil Data Viewer prior to 5.0 may remember that if you generated one thematic map and then generated a second thematic map before dropping the first thematic map, the attribute table associated with the second thematic map included the results of the first thematic map. Results for any number of soil attributes could be accumulated indefinitely.

In this version of Soil Data Viewer, the results for a thematic map contain only the results for the soil attribute that was the subject of that thematic map, regardless of how many thematic maps were previously generated. Results no longer accumulate as each new thematic map is generated.

If you wish to merge results for two or more thematic maps, this must be done manually using the capabilities of ArcMap. This document doesn't cover processes particular to ArcMap in detail.

The Parts of the Soil Data Viewer Interface

Below is a snapshot of the entire Soil Data Viewer application window. Notice that the application title bar indicates that Soil Data Viewer is currently running under ArcMap. When running standalone the title bar does not include the reference to ArcMap.
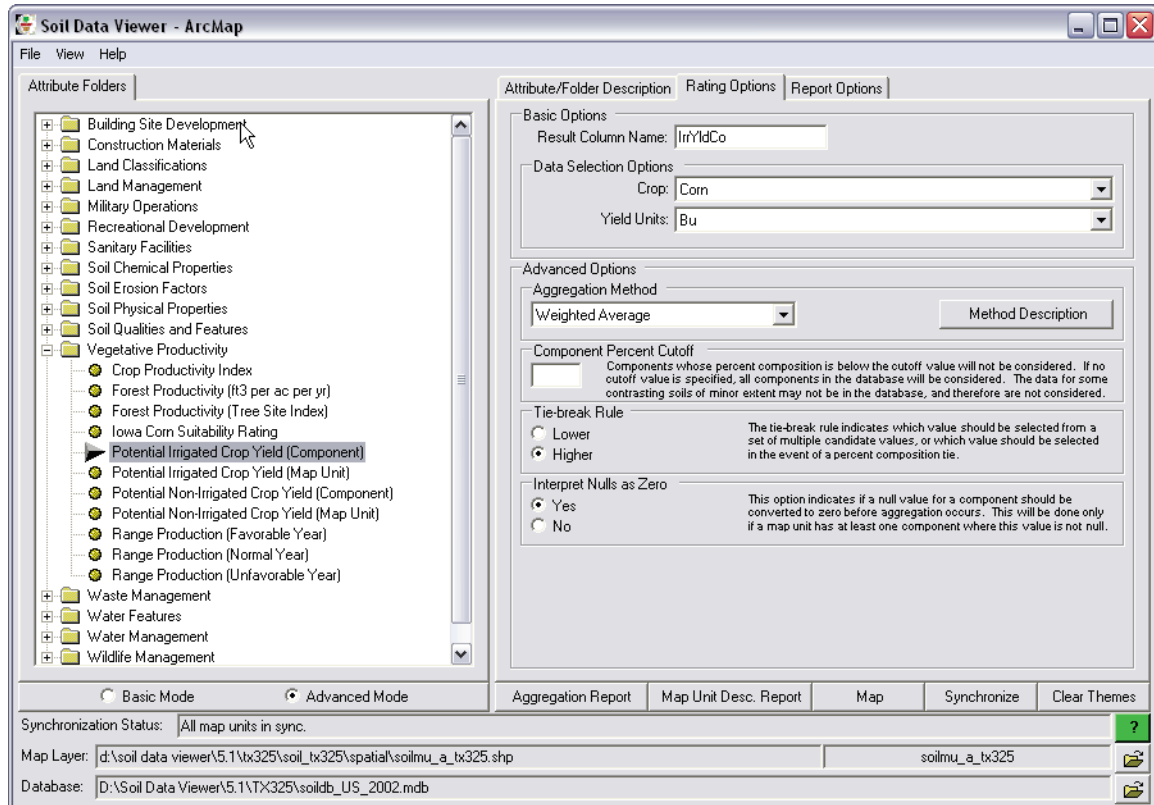
Menu Bar

The menu bar in Soil Data Viewer contains only three items, "File", "View" and "Help".

File Menu
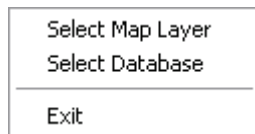
Selecting File: Select Map Layer opens the Select Soil Map Layer dialog.

Selecting File: Select Database opens the Select Soil Database dialog.

Selecting File: Exit terminates the Soil Data Viewer application.

View Menu

Attribute/Folder Description
Rating Options
Report Options
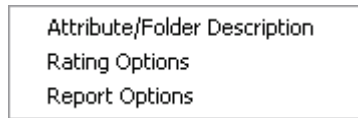
Selecting View: Attribute/Folder Description brings the Attribute/Folder Description tab to the foreground.

Selecting View: Rating Options brings the Rating Options tab to the foreground.

Selecting View: Report Options brings the Report Options tab to the foreground.

Help Menu

Soil Data Viewer Online User Guide
Soil Data Viewer Home Page

About Soil Data Viewer
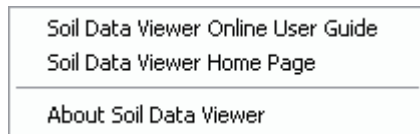
Selecting Help: Soil Data Viewer Online User Guide opens the Soil Data Viewer Online User Guide in a new browser window.

Selecting Help: Soil Data Viewer Home Page opens the home page of the Soil Data Viewer website in a new browser window.

Selecting Help: About displays the Soil Data Viewer application version information.

Main Tabs

There are four large tabs immediately under the menu bar, one tab to the left and three overlapping tabs to the right.

Attribute Folders Tab
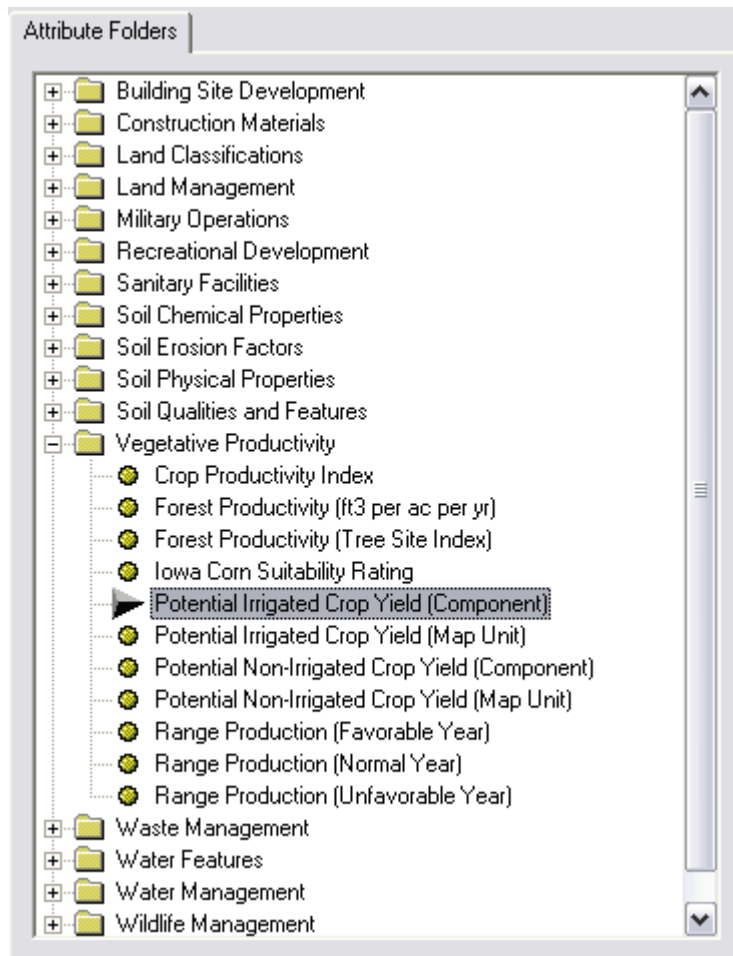
The tab to the left of the application window is the "Attribute Folders" tab. This tab shows the attribute folder tree that includes all of the attributes for which a thematic map or report can be generated. The list of folders displayed may vary from survey area to survey area depending on which programmatically generated soil interpretations were included in the dataset. If no interpretations normally listed in a particular folder were included, that folder will not be displayed.

A folder may be expanded or collapsed by clicking the plus or minus sign to the left of the folder name, respectively. A folder always contains only soil attributes. A folder cannot include subfolders.

A soil attribute must be selected before a map or report can be generated.

Attribute/Folder Description Tab
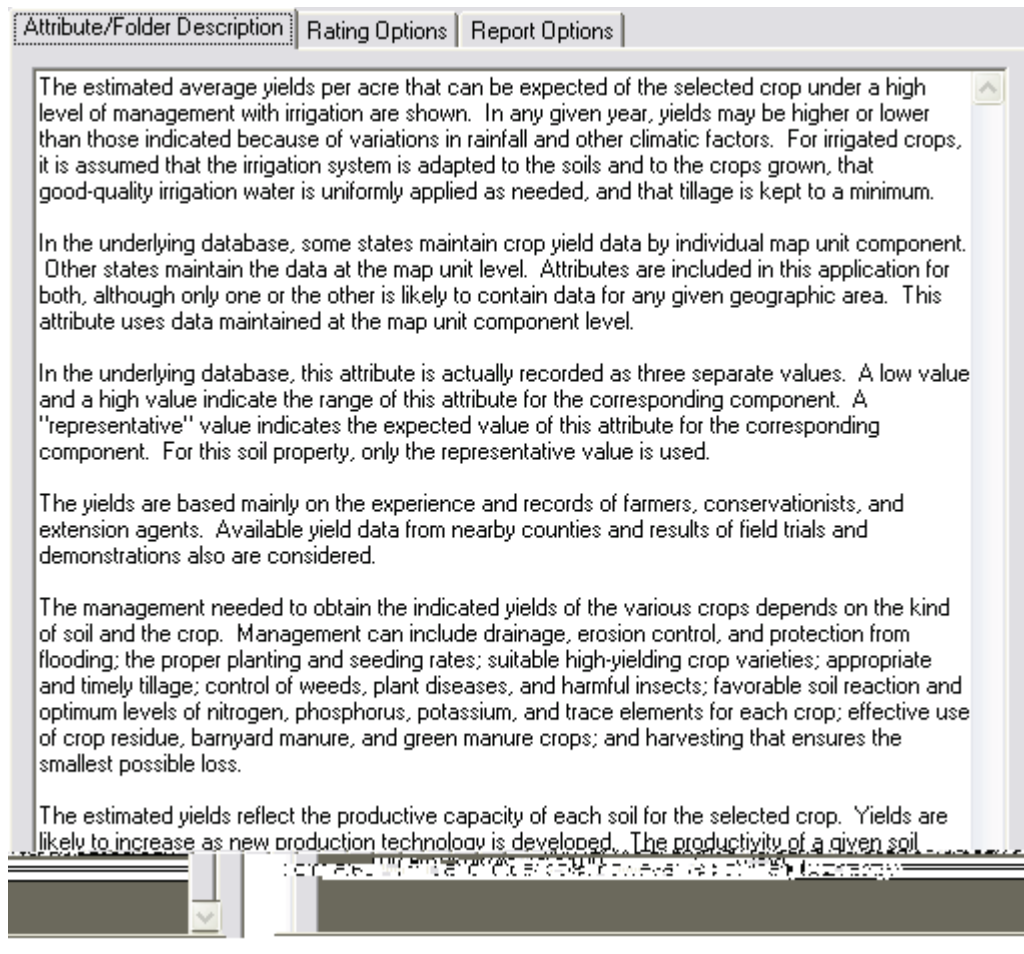
The leftmost of the three overlapping tabs to the right of the application window is the "Attribute/Folder Description" tab. When you click on an attribute or folder in the Attribute Folders tab, the description of that attribute or folder is displayed in this tab.

Rating Options Tab

The middle of the three overlapping tabs to the right of the application window is the "Rating Options" tab. This tab displays the rating options for the attribute that is currently selected in the Attribute Folders tab, if any. These options affect aspects of the aggregation process that occurs whenever a map or aggregation report is generated.

Basic Options

Options in this group are always editable, regardless of whether the application is in Basic Mode or Advanced Mode.

Result Column Name

This textbox contains the default name of column into which the output rating values will be stored, whenever a thematic map is generated. This column is visible if you open the feature attribute table associated with an ArcMap layer that was created by Soil Data Viewer. The default name provided can be changed prior to generating a thematic map.

The default name is supposedly connotative, but since the length of this name is limited to ten characters, it can still be fairly cryptic at times. The length of this name is limited to ten characters because if results are permanently saved to a shape file, the name of a column in a shape file cannot contain more than ten characters. Saving Soil Data Viewer results to a shape file is not recommended. See the section titled "Saving Results" for additional information.

Data Selection Options

Some of the soil attributes available in Soil Data Viewer are somewhat generically defined. In order to extract a value for such an attribute from the underlying soil database, additional qualifiers are required. For example we define an attribute like "Depth to Soil Restrictive Layer", but in the attribute definition we don't define what kind of restrictive layer we are referring to. The specific type of restriction with which we are concerned is selected at run time, as an additional qualifier to a generically defined attribute.

Some of these additional qualifiers are referred to as "data selection options". A soil attribute may have zero, one or two associated data selection options. Each data selection option associated with a soil attribute is presented as a dropdown choice list. For each data selection option, a choice must be selected before aggregation can be performed.

Sometimes no data selection option choices will be available. This can occur because no crop yields have been recorded for the current set of map units, or no restrictive layers have been recorded for the current set of map units. When this occurs, aggregation cannot be performed for the corresponding soil attribute.

Advanced Options

Options in this group are always visible but only editable, conditionally, when the application is in Advanced Mode. For some attributes, some of the advanced options cannot be changed, even in Advanced Mode.

Some of the options in this group are options that pertain to a soil property, as opposed to a soil interpretation. For a discussion of the difference between a soil property and a soil interpretation, please see the section titled "Basic Mode versus Advanced Mode".

Aggregation Method

For each soil attribute available in Soil Data Viewer, a default aggregation method is defined. But for most soil attributes, more than one aggregation method is potentially suitable. This option presents a dropdown list of all valid aggregation methods for the corresponding soil attribute. One of the more interesting aspects of Soil Data Viewer is to see how the rating for a map unit changes for different aggregation methods for the same soil attribute. For a discussion of the various aggregation methods, please see the section titled "Aggregation Method Descriptions".

Component Percent Cutoff

The section titled "Soil Survey 101" discussed the concept that map units are typically composed of one or more components. Some of these components compose a significant percent of the map unit, and some may compose only a minor percent of the map unit. There are times when you may not want the minor components of a map unit to influence

the rating for a particular soil attribute. This option allows you to specify a value such that a component whose percent composition is below this value will not be considered during the aggregation process.

Tie-break Rule

During the aggregation process, there may be a number of points at which it is necessary to select a single value from multiple candidate values. This can occur for more than one reason. We might be dealing with depth to water table for a given period of months, and we need to select only one depth value to represent the entire span of months. We might be doing a dominant component aggregation and there are two components with 40 percent composition. We can only return one of those two values to represent the map unit as a whole.

In these cases, we use the tie-break rule to decide which of the multiple candidate values should be returned. When the tie-break rule is "Lower", or some variant thereof, we return the lowest value among all candidate values (there may be more than two). When the tie-break rule is "Higher", or some variant thereof, we return the highest value among all candidate values.

When we are dealing with a numeric attribute, lower versus higher is an arithmetic comparison. When we are dealing with a non-numeric (string) attribute, lower versus higher is a collating sequence comparison, in other words we return the string that is "lower" or "higher" based on the ASCII collating sequence. This sequence specifies the relative order of all characters in a character set.

Null Values

When we are aggregating an attribute of a component, there may not be a value for that attribute in the database for every component in the corresponding map unit. So we have to decide what, if anything, to do about the components for which the value of the soil attribute in question is null.

For some aggregation methods it makes sense to include a component with a null value in the aggregation process. If you are doing a dominant component aggregation for Percent Clay, and no clay content is recorded for the dominant component, then the Percent Clay rating value for the corresponding map unit should be null.

But for the aggregation method "Weighted Average", we can't deal with components with null attribute values because we can't use null values in an arithmetic expression. Therefore components with null values are automatically excluded from a "Weighted Average" aggregation.

During the aggregation process it is often necessary to select one value from a group of candidate values. In general it doesn't make any sense to compare a null value with a non-null value, but in the case of a tie between a null value and a non-null value, Soil Data Viewer always returns the non-null value.

All of the above is necessary background for understanding this option. When "Interpret Nulls as Zero" is checked, if at least one component of a map unit has a non-null value for the soil attribute in question, a null attribute value for any other component of that map unit will be converted to zero.

One of the reasons for offering this option was to produce more meaningful results when it comes to an attribute like crop yield. The default aggregation method for any crop yield attribute is "Weighted Average". Let's say we have a map unit with two components, each at 50 percent composition. For component 1, the yield for crop X is 100. For component 2, no yield is recorded for crop X.

If the option to "Interpret Nulls as Zero" is not set, the yield value returned for the map unit described above would be 100. Because the crop yield value for component 2 is null, that component is not considered during the aggregation process. Therefore the component 1 effectively represents 100% of the map unit.

If the option to "Interpret Nulls as Zero" is set, the yield value returned for the map unit described above would be 50. In this case the yield value for component 2 would have been set to 0. Both components would now participate in the weighted average calculation, each contributing 50% of the result.

There are also soil properties, like "Calcium Carbonate (CaCO3)" for which a null value logically implies zero. For such an attribute, "Interpret Nulls as Zero" will typically be set by default.

The default value of this option should represent the most appropriate choice for the corresponding soil property.

Month Range

Certain temporal soil attributes, like flooding frequency and water table depth are recorded by month. When performing an aggregation for an attribute that is recorded by month, a beginning and ending month must always be specified. Beginning and ending month may be the same. The order in which the months are specified matters. January to December includes all 12 months. December to January includes only 2 months.

Layer Options

A component is typically composed of multiple soil horizons. For an attribute of a soil horizon it is necessary to specify some sort of depth qualification to indicate how much of the soil profile should be considered. When the depth qualification encompasses more than one soil horizon, a set of horizon values has to be reduced down to a single value to represent the corresponding component as a whole. We refer to this process as "horizon aggregation". For an additional discussion of horizon aggregation, please see the section titled "Horizon Aggregation".

Depth qualification can be specified in three different ways:

1. Surface Layer – The soil attribute value for the surface horizon serves as the value for the corresponding component. In this case there is only one value, therefore horizon aggregation does not have to be performed.

2. Depth Range – An upper and lower depth must be specified, in addition to units of measure (centimeters or inches). The lower depth must be greater than the upper depth, and the upper depth can be greater than zero. The specified depth range may encompass all or part of more than one soil horizon, in which case horizon aggregation may need to be performed. Note that the choice of centimeters or inches here does not alter the units displayed in the output – only the depth of soil considered.

3. All Layers – All soil horizons (the entire soil profile) may be considered. Horizon aggregation may need to be performed for components with more than one soil horizon.

Report Options Tab

The rightmost of the three overlapping tabs to the right of the application window is the "Report Options" tab. The options on this tab allow you to include additional information in an aggregation report and control which map units appear in an aggregation report or map unit description report.

Aggregation Report Options

These options pertain exclusively to an aggregation report. There are no options for a map unit description report.

Rating Options

Most soil attributes have a number of associated options that must be specified before aggregation can be performed. In an aggregation report, the values of those options are always printed at the top of each report page, regardless of whether or not this report

option is checked. When this option is checked, those rating options, along with their corresponding narrative descriptions, if any, will be included at the end of the report.

Component Breakdown and Rating Reasons

In the section titled "Basic Mode versus Advanced Mode", the difference between a soil property and a soil interpretation was discussed. For a programmatically generated soil interpretation, in addition to the rating value for the corresponding interpretation, the tabular data includes the reasons, if any, as to why the corresponding rating was assigned.

For example, let's say were talking about the soil interpretation "Dwellings with Basements". If the rating value for this attribute is "Not Limited", this means that there are no known limitations preventing the corresponding map unit from being used as a site for a dwelling with a basement. In this particular case, no reasons are provided. Reasons are only provided when a soil isn't completely suitable for a particular use. Had the rating value for this attribute been "Very Limited", one or more corresponding reasons for this rating, depth to water table for example, should be available.

When "Component Breakdown and Rating Reasons" is checked, an aggregation report includes components that share the rating that was assigned to their corresponding map unit. For each of those components, their corresponding percent composition is displayed as well as the reason or reasons that each of those components was assigned that rating.

Additional Reports Button

Soil Data Viewer is one of a number of applications that *n*
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tdh   t1,T   s5onT0.001   Tc00   Tw   00D   s
t   ang10as1vaip.   ubeiin1.Tc   0   Tw   .   /T.T.0TrN
usewTre   in   a..   Tw   0.   und1,Tls1   ont
Vlagu

selected in this table has no effect on which map units are included in a thematic map. Which map units are included in a thematic map is controlled by which map units are currently selected in the controlling soil map layer in ArcMap.

Selecting map units for inclusion in a report doesn't work exactly the same as selecting map unit polygons for inclusion in a thematic map. When no map unit polygons in the controlling soil map layer are explicitly selected, all map unit polygons are then considered to be implicitly selected. This is not true for selecting map units for inclusion in a report. If no map units in the map unit table are explicitly selected, no report can be generated.

Table Label

The table label indicates whether the map units in the table correspond to all map units in the underlying soil database (i.e. Soil Data Viewer is running standalone), or only those map units in the underlying soil database in common with those map units that are currently selected in the current soil map layer (i.e. Soil Data Viewer is running as a plug-in to ArcMap).

Table Title Bar

The table title bar reflects which map units are currently visible in the table. At any given moment, either only currently selected map units, only currently unselected map units, or all map units (selected and unselected), will be displayed in the table. Which map units are displayed in this table at any given moment is controlled by the View Selected Map Units/View Unselected Map Units/View All Map Units toggle button.

Select All Button

Clicking this button selects all map units that are currently visible in the table. Keep in mind that which map units are visible in the table at any given moment depends on the current state of the View Selected Map Units/View Unselected Map Units/View All Map Units toggle button.

Unselect All Button

Clicking this button deselects all map units that are currently visible in the table. Keep in mind that which map units are visible in the table at any given moment depends on the current state of the View Selected Map Units/View Unselected Map Units/View All Map Units toggle button.

View Selected Map Units/View Unselected Map Units/View All Map Units Toggle Button

Clicking this toggle controls which map units are displayed in the table at any given moment. This buttons toggles through displaying either only currently selected map units, only currently unselected map units, or all map units (selected and unselected).

Row of Controls Spanning the Application Window, Under the Main Tabs

Basic Mode/Advanced Mode Radio Buttons

This option group is used to switch between Basic Mode and Advanced Mode. For a discussion of the difference between Basic Mode and Advanced Mode, please see the section titled "Basic Mode versus Advanced Mode".

When switching from Advanced Mode to Basic Mode, if the currently selected folder or attribute is not available in Basic Mode, your current position in the attribute folder tree will be lost.

Aggregation Report Button

Providing that all prerequisites have been satisfied, clicking the "Aggregation Report" button generates an aggregation report for the currently selected soil attribute, for those map units that are currently selected in the map unit table on the Report Options tab. An aggregation report may not be able to be generated for any of the following reasons:

1. You haven't selected a soil attribute from the Attribute Folders tree.

2. Not all required rating options have been specified or could be specified, or one or more of the rating options that were specified are invalid.

3. No map units are currently available in the map unit table on the Report Options tab. This can occur for two reasons; (A) there are no map units in the underlying soil database or (B) there are no map units in common between the underlying soil database and the map units that are currently selected in the current soil map layer in ArcMap.

Map Unit Desc. Report Button

Clicking the "Map Unit Desc. Report" button generates a map unit description report for those map units that are currently selected in the map unit table on the Report Options tab. A map unit description report may not be able to be generated because no map units are currently available in the map unit table on the Report Options tab. This can occur for two reasons; (A) there are no map units in the underlying soil database or (B) there are no map units in common between the underlying soil database and the map units that are currently selected in the current soil map layer in ArcMap.

Map Button

Providing that all prerequisites have been satisfied, clicking the "Map" button generates a thematic map for the currently selected soil attribute, for those map units that are currently selected in ArcMap that have a counterpart in the underlying soil database. A thematic map may not be able to be generated for any of the following reasons:

1. You haven't selected a soil attribute from the Attribute Folders tree.

2. Not all required rating options have been specified or could be specified, or one or more of the rating options that were specified are invalid.

3. There are not any map units in common between the map units that are currently selected in ArcMap and the map units that exist in the underlying soil database.

Synchronize Button

Clicking the "Synchronize" button updates the current synchronization status. While synchronization status is automatically updated when certain events occur, you may want to manually trigger synchronization in order to determine if there is anything in common between the map units that are currently selected in ArcMap and the map units that exist in the underlying soil database. For a complete discussion of synchronization, please see the section titled "Synchronization".

Clear Themes Button

Whenever a new thematic map is generated, that theme is added to ArcMap as a temporary layer. Layers accumulate as you generate one thematic map after another. These temporary layers are deleted when you terminate your ArcMap session. If you wish to delete one of these temporary layers prior to terminating your ArcMap session, you can right click on that layer's name in ArcMap and select "Remove". Clicking the "Clear Themes" button removes all temporary layers and tables created by Soil Data Viewer.

Synchronization Status Related Controls

The synchronization status related controls are only visible when running Soil Data Viewer as a plug-in under ArcMap.

| Synchronization Status:	All map units in sync.	?
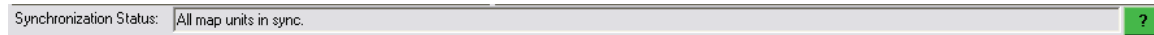
Synchronization Status

The synchronization status textbox displays the concise version of the synchronization status at the last time that synchronization was performed. For a complete discussion of synchronization, please see the section titled "Synchronization".

Synchronization Status Help Button

Clicking the synchronization status help button opens a dialog that explains the corresponding synchronization status in detail. The background color of this button, green, yellow or red, also implies the synchronization state at the last time that synchronization was performed. For a complete discussion of synchronization, please see the section titled "Synchronization".

Map Layer Related Controls

Map Layer:	d:\sdm downloads\shape file\soil_tx325\spatial\soilmu_a_tx325.shp	soilmu_a_tx325	
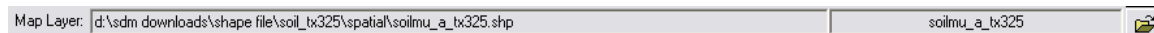
The map layer related controls are only visible when running Soil Data Viewer as a plug-in under ArcMap.

Map Layer Source

The map layer source textbox displays the fully qualified pathname of the shape file that is the source of the current "soil map layer". The map layer source is displayed simply to remind you which set of soil spatial data is serving as the current "soil map layer". For a complete discussion of "the soil map layer", please see the section titled "Specifying a Valid Soil Map Layer".

Map Layer Name

The map layer name textbox displays the name of the layer in ArcMap that is serving as the current "soil map layer". In many cases, the map layer name is the same as the non-extension portion of the name of the shape file that is the source of the current "soil map layer", but these two names are not necessarily equivalent. The map layer name is displayed simply to remind you which soil map layer in ArcMap is serving as the current "soil map layer". For a complete discussion of "the soil map layer", please see the section titled "Specifying a Valid Soil Map Layer".

Open the Select Soil Map Layer Dialog Button

Clicking this button opens the Select Soil Map Layer dialog, shown below. This dialog is used to select which candidate soil map layer should serve as the current "soil map layer". For a complete discussion of "the soil map layer", please see the section titled "Specifying a Valid Soil Map Layer".
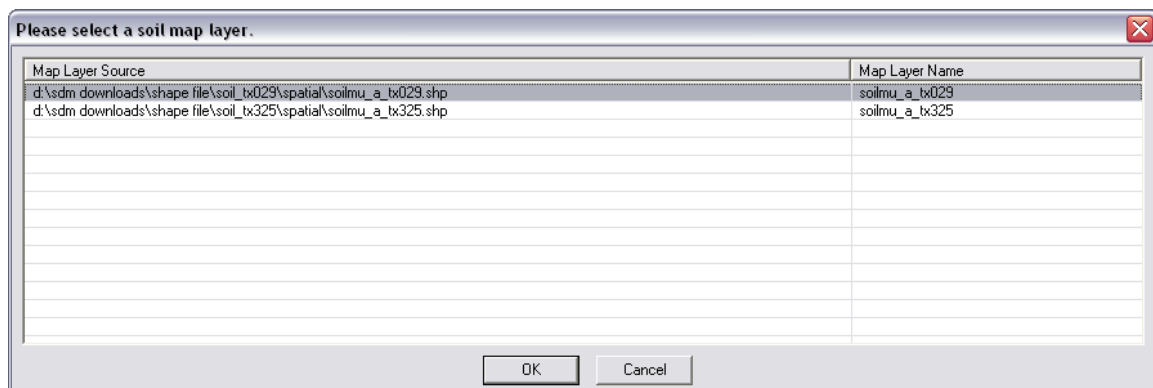
## *Database Related Controls*

Database File Name

The database file name textbox displays the fully qualified pathname of the SSURGO template database that is currently serving as the underlying soil database. The database file pathname is displayed simply to remind you which set of soil tabular data is currently being used.

Open the Select Soil Database Dialog Button

Clicking this button opens the Select Soil Database dialog, shown below. This dialog is used to select the SSURGO template database that should serve as the current source of soil tabular data.
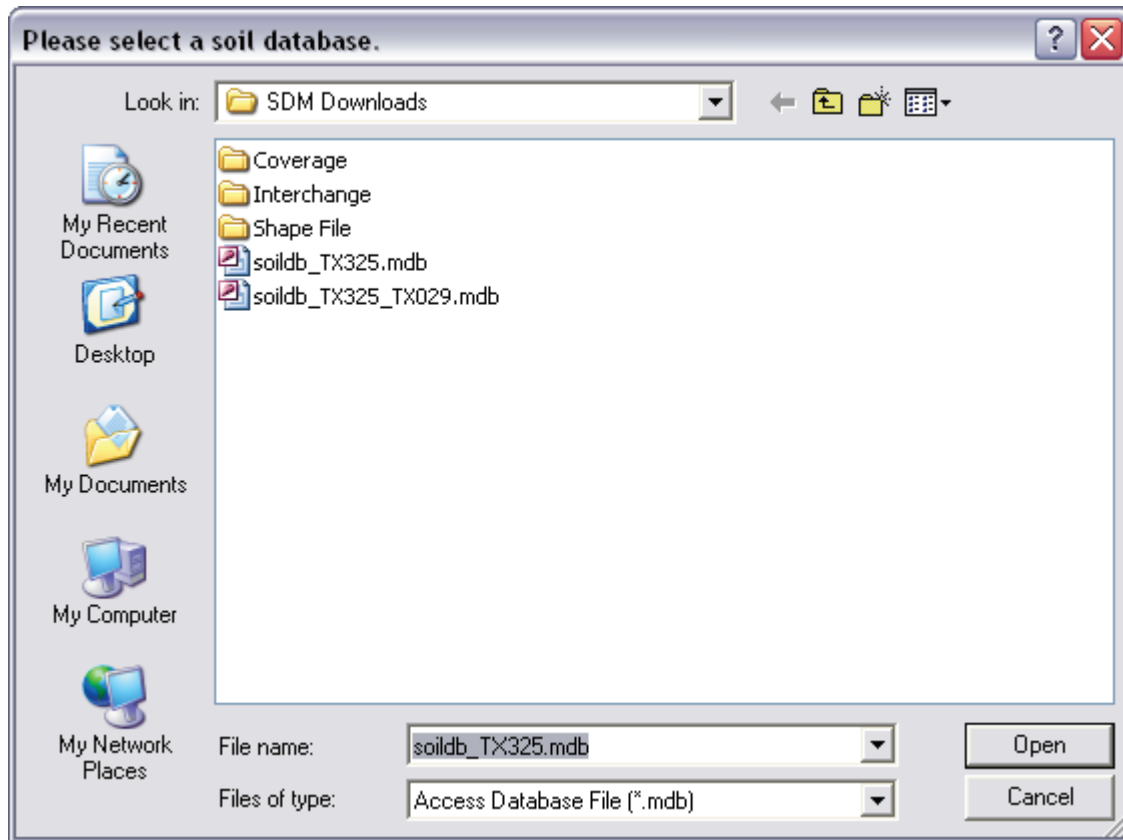
Obtaining Additional Help for Soil Data Viewer

For questions or requests related to Soil Data Viewer, please contact the Soils Hotline at the NRCS National Soil Survey Center in Lincoln Nebraska by e-mail or phone at:

SoilsHotline@lin.usda.gov

Steve Speidel
(402) 437-5378

Tammy Cheever
(402) 437-5379

The Soils Hotline is typically staffed from 8:00 AM to 4:30 PM Central Time.